9th Class 2019

Math (Science)	Group-I	Paper-I
Time: 2.10 Hours	(Subjective Type)	Max. Marks: 60

(Part-I)

2. **Write short answers to any Six (6) questions: 12**

(i) **Define column matrix.**

Ans A matrix is called a column matrix if it has only one column. e.g., $M = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $N = \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}$ are column matrices of order 2 – by – 1 and 3 – by – 1 respectively.

(ii) **Find the transpose of the matrix: $B = [5 \quad 1 \quad -6]$**

Ans Given, $B = [5 \quad 1 \quad -6]$

Transpose: $B^t = \begin{bmatrix} 5 \\ 1 \\ -6 \end{bmatrix}$

(iii) **Simplify: $\sqrt[3]{-125}$.**

Ans

$$\begin{aligned}\sqrt[3]{-125} &= (-125)^{1/3} \\ &= [-(5 \times 5 \times 5)]^{1/3} \\ &= [-(5^3)]^{1/3} \\ &= -5^{3\times 1/3} = -5^1 \\ &= -5\end{aligned}$$

(iv) **Write real and imaginary parts of the number:**

$-1 + 2i$

Ans Real Part = -1

Imaginary Part = $2i$

(v) **Express in scientific notation: 83,000**

Ans

$$\begin{aligned}83000 &= 83000 \times \frac{10000}{10000} \\ &= \frac{83000}{10000} \times 10000 \\ &= 8.3 \times 10^4\end{aligned}$$

(vi) Find the value of x $\log_3 x = 4$

Ans $\log_3 x = 4$

By writing in exponential form, we have:

$x = 3^4$

Thus, $x = 81$

(vii) Evaluate $\frac{x^3y - 2z}{xz}$ for $x = -1, y = -9, z = 4$

Ans By putting the values of x, y and z in the expression, *i.e.*,

$$\frac{x^3y - 2z}{xz} = \frac{(-1)^3(-9) - 2(4)}{(-1)(4)}$$

$$= \frac{(-1)(-9) - 8}{-4}$$

$$= \frac{9 - 8}{-4}$$

$$= \frac{-1}{4}$$

(viii) Rationalize the denominator : $\frac{58}{7 - 2\sqrt{5}}$

Ans

$$\frac{58}{7 - 2\sqrt{5}} = \frac{58}{7 - 2\sqrt{5}} \times \frac{7 + 2\sqrt{5}}{7 + 2\sqrt{5}}$$

$$= \frac{58(7 + 2\sqrt{5})}{(7 - 2\sqrt{5})(7 + 2\sqrt{5})}$$

$$= \frac{58(7 + 2\sqrt{5})}{(7)^2 - (2\sqrt{5})^2}$$

$$= \frac{58(7 + 2\sqrt{5})}{49 - 20}$$

$$= \frac{58(7 + 2\sqrt{5})}{29}$$

$$= 2(7 + \sqrt{5})$$

(ix) Factorize: $24x^2 - 65x + 21$

Ans

$24x^2 - 65x + 21$

$= 24x^2 - 56x - 9x + 21$

$= 8x(3x - 7) - 3(3x - 7)$

$= (3x - 7)(8x - 3)$

3. Write short answers to any Six (6) questions: 12

(i) Find the H.C.F of the following expression:

$102xy^2z$, $85x^2yz$ and $187xyz^2$

Ans

Factors of $102xy^2z = 2 \times 3 \times 17 \times x \times y \times y \times z$

Factors of $85x^2yz = 5 \times 17 \times x \times x \times y \times z$

Factors of $187xyz^2 = 11 \times 17 \times x \times y \times z \times z$

H.C.F = Multiplication of common factors

$= 17xyz$

(ii) Solve the equation: $\sqrt{5x-7} - \sqrt{x+10} = 0$

Ans $\sqrt{5x-7} - \sqrt{x+10} = 0$

$$\sqrt{5x-7} = \sqrt{x+10}$$

Squaring both sides, we get

$$\left(\sqrt{5x-7}\right)^2 = \left(\sqrt{x+10}\right)^2$$

$$5x - 7 = x + 10$$

$$5x - x = 10 + 7$$

$$4x = 17$$

$$x = \frac{17}{4}$$

(iii) Solve: $|2x + 3| = 11$

Ans $|2x + 3| = 11$

$\pm(2x + 3) = 11$

$2x + 3 = 11$;	$-(2x + 3) = 11$
$2x = 11 - 3$;	$2x + 3 = -11$
$2x = 8$;	$2x = -11 - 3$
$x = \frac{8}{2}$;	$2x = -14$
$x = 4$;	$x = \frac{-14}{2}$
;	$x = -7$

(iv) Find the value of m and c of $2x - y = 7$ by expressing it in the form of $y = mx + c$.

Ans Given, $2x - y = 7$

$$-y = -2x + 7$$

$$y = 2x - 7 \qquad (1)$$

By comparing equ (1) with $y = mx + c$, we get

$$m = 2$$

and $$c = -7$$

(v) Define origin.

Ans The point O, where x-axis and y-axis meet is called origin.

(vi) Find the distance between the points:

A(–8, 1), B(6, 1)

Ans $A(-8, 1), B(6, 1)$

Here, $x_1 = -8$, $y_1 = 1$

$x_2 = 6$, $y_2 = 1$

The Distance Formula is:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(6 - (-8))^2 + (1 - 1)^2}$$
$$= \sqrt{(6 + 8)^2 + (0)^2}$$
$$= \sqrt{(14)^2}$$
$$= 14$$

(vii) Define scalene triangle.

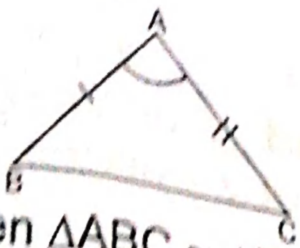
Ans A triangle is called a scalene triangle if measures of all the three sides are different.

(viii) State S.A.S. postulate.

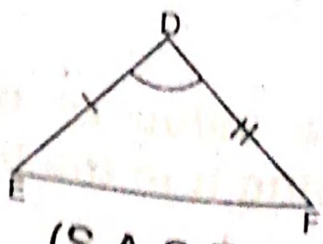
Ans In any correspondence of two triangles, if two sides and their included angle of one triangle are congruent to the corresponding two sides and their included angle of the other triangle, then the triangles are congruent.

In $\triangle ABC \longleftrightarrow \triangle DEF$, shown in the following figures,

$$\text{if} \begin{cases} \overline{AB} \cong \overline{DE} \\ \angle A \cong \angle D \\ \overline{AC} \cong \overline{DF} \end{cases}$$



then $\triangle ABC \cong \triangle DEF$



(S.A.S Postulate)

e parallelogram.

ure formed by four non-collinear points in the lled a parallelogram if:

posite sides are of equal measure;

posite sides are parallel;

ure of none of the angles is 90^{o}.

short answers to any Six (6) questions: 12

ne the bisector of a line segment.

e 'l' is called the bisector of line segment if l is ılar to the line segment and passes through its

ı, 4 cm, 5 cm are the length of the triangle. the reason.

$3 + 4 > 5$ (i)

$3 + 5 > 4$ (ii)

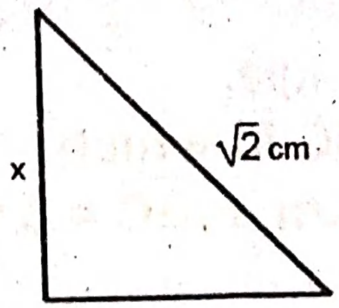
$4 + 5 > 3$ (iii)

m (i), (ii) and (iii) it is proved that the given set can from Because, by theorem, the sum of the lengths of any two triangle is greater than the length of the third side.

ine congruent triangles.

/o triangles are said to be congruent written ally as, $\cong$, if there exists a correspondence them such that all the corresponding sides and re congruent.

d unknown value of x in given figure:



the above triangle is right angled ΔABC. So, In gled, by Pythagoras Theorem:

$$2 - 1 = x^2$$

$$\Rightarrow \quad x^2 = 1$$

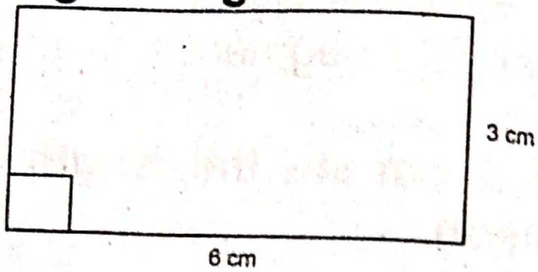
$$\sqrt{x^2} = \sqrt{1}$$

$$x = 1 \text{ cm}$$

(v) What is converse of Pythagoras theorem?

Ans If the square of one side of a triangle is equal to sum of squares of the other two sides then the triangle right angled triangle.

(vi) Find area of given figure:



Ans Length of the rectangle = 6 cm

Width of the rectangle = 3 cm

Area of the rectangle = Length × Width

$= 6 \times 3$

$= 18$ sq. cm

(vii) Define the triangular region.

Ans A triangular region is the union of a triangle and interior, *i.e.*, the three line segments forming the triang and its interior.

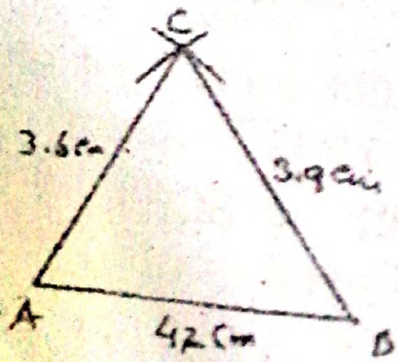
(viii) What is meant by circumcentre?

Ans The point of concurrency of the three perpendicula bisectors of the sides of a triangle is called th circumcentre of the triangle.

(ix) Construct a ΔABC in which:

$m\overline{AB} = 4.2$ cm, $m\overline{BC} = 3.9$ cm, $m\overline{CA} = 3.6$ cm

Ans



Steps of Construction:

1. Take a line segment $\overline{AB}$ of length 4.2 cm.
2. Take A as centre and drawn arc of 3.6 cm radius.
3. Take B as centre and draw an arc of 3.9 cm radius. This cuts the first arc at C.
4. Join C to A, B.

ABC is the required triangle.

(Part-II)

NOTE: Attempt THREE (3) questions in all. But question No. 9 is Compulsory.

Q.5.(a) Solve the system of linear equations by Cramer's rule: **(4)**

$$2x - 2y = 4$$
$$3x + 2y = 6$$

Ans For Answer see Paper 2017 (Group-I), Q.5.(a).

(b) Simplify: $\left(\dfrac{a^{2l}}{a^{l+m}}\right)\left(\dfrac{a^{2m}}{a^{m+n}}\right)\left(\dfrac{a^{2n}}{a^{n+l}}\right)$ **(4)**

Ans For Answer see Paper 2018 (Group-II), Q.5.(b).

Q.6.(a) Use log table to find the value of: **(4)**

$$0.8176 \times 13.64$$

Ans

$$x = 0.8176 \times 13.64$$
$$\log x = \log(0.8176 \times 13.64)$$
$$= \log 0.8176 + \log 13.64$$
$$= 0.0874 + 1.1348$$
$$\log x = 1.0473$$
$$\text{Antilog}(\log x) = \text{Antilog}(1.0473)$$
$$x = 11.15$$

(b) If $m + n + p = 10$ and $mn + np + mp = 27$, then find the value of $m^2 + n^2 + p^2$. **(4)**

Ans For Answer see Paper 2017 (Group-I), Q.6.(b).

Q.7.(a) Factorize: $9x^4 + 36y^4$ **(4)**

Ans

$$9x^4 + 36y^4 = 9x^4 + 36y^4 + 36x^2y^2 - 36x^2y^2$$
$$= (3x^2)^2 + (6y^2)^2 + 2(3x^2)(6y^2) - (6xy)^2$$
$$= (3x^2 + 6y^2)^2 - (6xy)^2$$

$$= (3x^2 + 6y^2 + 6xy)(3x^2 + 6y^2 - 6xy)$$
$$= (3x^2 + 6xy + 6y^2)(3x^2 - 6xy + 6y^2)$$

(b) For what value of k is $(x + 4)$ the H.C.F of $x^2 + x - (2k + 2)$ and $2x^2 + kx - 12$? (4)

Ans For Answer see Paper 2016 (Group-I), Q.7.(b).

Q.8.(a) Solve: $-5 \leq \dfrac{4 - 3x}{2} < 1$ (4)

Ans Firstly, multiply by 2

$$-10 \leq 4 - 3x < 2$$

Substracting by '4' we get

$$-10 - 4 \leq 4 - 3x - 4 < 2 - 4$$
$$-14 \leq -3x < -2$$

Dividing by −3, we have

$$\frac{-14}{-3} \geq \frac{-3x}{-3} > \frac{-2}{-3} \quad \text{(Change of Sign)}$$
$$\frac{14}{3} \geq x > \frac{2}{3}$$
$$\frac{2}{3} < x \leq \frac{14}{3}$$

(b) Construct the ΔABC, also draw the bisectors of their angles: (4)

$m\overline{AB} = 3.6$ cm, $m\overline{BC} = 4.2$ cm and $m\angle B = 75^\circ$

Ans For Answer see Paper 2016 (Group-I), Q.8.(b).

Q.9. Prove that any point inside an angle, equidistant from its arms, is on the bisector of it. (8)

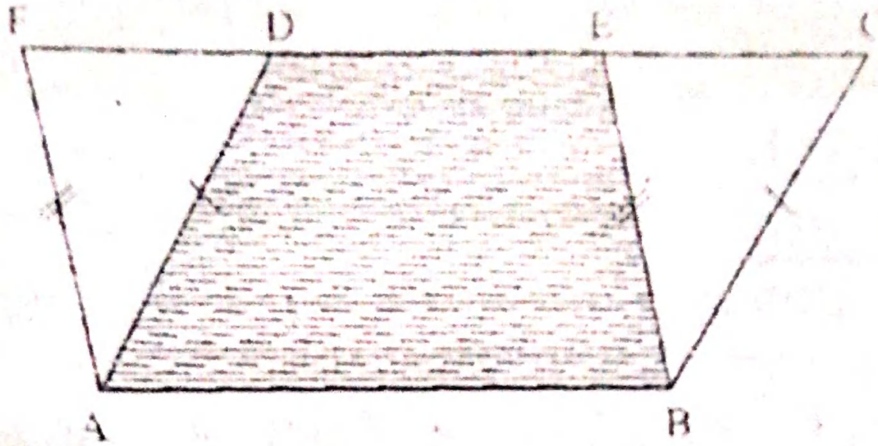
Ans For Answer see Paper 2015 (Group-I), Q.9.

OR

Prove that parallelograms on the same base and between the same parallel line (or of the same altitude) are equal in area.

Ans **Given:**

Two parallelograms ABCD and ABEF having the same base $\overline{AB}$ and between the same parallel lines $\overline{AB}$ and $\overline{DE}$.



To Prove:

The area of parallelogram ABCD = area of parallelogram ABEF.

Proof:

Statements	Reasons
area of (parallelogram ABCD) = area of (quad. ABED) + area of (ΔCBE) (1)	[Area addition axiom]
area of (parallelogram ABEF) = area of (quad. ABED) + area of (ΔDAF) (2)	[Area addition axiom]
In Δs CBE and DAF	
$m\overline{CB} = m\overline{DA}$	[opposite sides of a parallelogram]
$m\overline{BE} = m\overline{AF}$	[opposite sides of a parallelogram]
$\angle CBE = \angle DAF$	[$\because$ BC||AD, BE||AF]
$\Delta CBE \leq \Delta DAF$	
$\therefore$ area of (ΔCBE) = area of (ΔDAF) (3)	[cong. area axiom]
Hence area of (parallelogram ABCD) = area of (parallelogram ABEF)	from (1), (2) and (3)